29 August 2003

To: Paul Philp
DOE Project Manager, Run IIb CDF Detector Project

From: Pat Lukens
Project Manager for the Run IIb CDF Detector Project

Subject: Run IIb CDF Detector Project July 2003 Report

Attached is the monthly report summarizing the July 2003 activities and progress for the Fermilab RunIIb CDF Detector Project. This report is available electronically at:

http://www-cdf.fnal.gov/run2b.html

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RunIIb CDF Detector Project
Progress Report No. 8
1 - 31 July 2003

I. PROJECT DESCRIPTION

The primary goal of the CDF Run IIb Detector Project is to enable the detector to exploit the physics opportunities available during Tevatron operation through 2008. The data from Run II will represent a set of detailed measurements that can be compared with the predictions of the Standard Model at the highest available collision energy. The main focus of the experiment in Run IIb will be the continuation of the search for the Higgs boson. The increased size of the data sample will also allow us to study the top quark by measuring the details of its production and decay mechanism. In addition, we plan precision electroweak and QCD measurements, continued searches for a variety of phenomena that are predicted to exist beyond the Standard Model framework, and to explore CP violation in the *b* quark sector. The detailed physics goals of the upgrade are described in the Technical Design Report (TDR).

The major tasks of this upgrade are:

- Replace the silicon micro-vertex detector with a device capable of withstanding the expected radiation dose for Run IIb with fast r-ϕ (axial) and small angle stereo readout.
- Upgrade the calorimeter by replacing the Central Preradiator Chamber with a device with shorter response time to allow operation in a high-luminosity environment, and adding timing information to the electromagnetic calorimeters.
- Upgrade the data acquisition and trigger systems to increase throughput needed for higher luminosity operation and efficiently trigger on the higher multiplicity events of Run IIb.

II. OVERVIEW OF PROJECT STATUS – P. Lukens

The project has still not received approval beyond CD-3a. This approval will be needed within a month, or the schedule will be impacted. A review of the accelerator plans was performed in July, and new design and base luminosity projections were shown. The reduction in expectations from the Tevatron since the baseline readiness review has made recruitment of additional collaborators into the project difficult.

The project continues to make steady technical progress. A workshop was held at LBL to cover the plans for the preproduction versions of the silicon detector elements. Similarly, a meeting was held at U. of Chicago to coordinate the development of the TDC design with the track trigger design.

III. PROJECT MILESTONE SUMMARY

CDF Level 2 Schedule Milestones from the Resource Loaded schedules

WBS	Title	Baseline Completion Date	Forecast/Actual Completion Date	Complete
1.1.5.4.1.13	Prototype stave #1 complete	5-Dec-02	5 Nov 02	Yes
1.1.2.10.2.4	Testing #1 complete- go ahead for #2	3-Apr-03	3-Apr-03	Yes
1.1.2.1.2.4	2nd chip submission	4-Apr-03	4-Apr-03	Yes
1.1.3.1.2.4	Production Sensor submission	25-Apr-03	25-Apr-03	Yes
1.2.1.10.1	First phototube order placed	9-May-03	1-Apr-03	Yes
1.2.2.2.7.1	Prototype Testing Complete	16-May-03	28-Mar-03	Yes
1.2.2.2.7.4	ASD->TDC Cables ready for installation	16-May-03	26-Aug-03	
1.2.2.2.7.2	CEM Splitters ready for installation	19-May-03	29-Jul-03	Yes
1.2.2.2.7.3	PEM Harnesses ready for installation	2-Sep-03	28-Apr-03	Yes
1.2.2.2.7.5	All cables done and ready to install	2-Sep-03	26-Aug-03	
1.3.5.2.5	Arrival of 0/10 PCs from the vendor	10-Sep-03	10-Sep-03	
1.2.1.10.2	1st Calorimeter WLS fiber holder finished	7-Oct-03	4-Dec-03	
1.2.2.2.7.8	VME Crate ready for installation	7-Oct-03	30-Apr-03	Yes
1.1.2.1.3.5	Production chip submission	21-Oct-03	18-Sep-03	
1.3.1.6.7	First Prototype TDC available for test	19-Nov-03	19-Nov-03	
1.1.6.3.1.1.5	Stave & screen mounting tests complete	5-Dec-03	5-Dec-03	
1.2.1.10.4	1st CPR module finished and tested	11-Dec-03	12-Feb-04	
1.1.2.10.3.4	Go ahead for Preproduction	18-Dec-03	4-Dec-03	
1.2.2.2.7.10	Upstairs components ready to install	7-Jan-04	7-Jan-04	
1.2.2.2.7.11	All EM Timing components ready to install	7-Jan-04	8-Jan-04	
1.2.2.2.7.6	ASD/TB ready for installation	7-Jan-04	8-Jan-04	
1.2.2.2.7.7	Downstairs components ready to install	7-Jan-04	8-Jan-04	
1.2.2.2.7.9	TDC boards ready for installation	7-Jan-04	11-Jun-04	
1.3.3.2.3.4	Begin fabrication of Prototype Finder 1/3 board	8-Jan-04	8-Jan-04	
1.2.1.10.3	First set of Calorimeter phototubes tested	30-Jan-04	20-Oct-03	
1.2.1.10.6	1st CCR module finished and tested	12-Feb-04	8-Apr-04	
1.3.3.8.1.9	Prototype XFT Linker Module available for testing	26-Mar-04	26-Mar-04	
1.1.2.3.1.3.12	Preproduction hybrid available	29-Apr-04	29-Apr-04	
1.2.1.10.5	2nd set of Calorimeter phototubes tested	21-May-04	18-Feb-04	
1.1.5.2.2.8	L0 prototype modules complete	26-May-04	14-May-04	
1.3.4.4.1.4	Prototype Event Builder hardware arrives	3-Jun-04	3-Jun-04	
1.2.1.10.7	50% Calorimeter CPR Detectors Tested	4-Jun-04	2-Aug-04	
1.3.4.5.3	Production Readiness Rev - Event Builder	24-Jun-04	24-Jun-04	
1.1.2.10.4.6	Go ahead for DAQ production	23-Aug-04	23-Aug-04	

Milestone list continues on following page

WBS	Title	Baseline Completion Date	Forecast/Actual Completion Date	Complete
1.2.1.10.8	50% Calorimeter CCR Detectors tested	30-Aug-04	26-Oct-04	
1.3.2.6.3	Begin production of Level 2 Pulsar system	17-Sep-04	17-Sep-04	
1.3.3.10.3.3	Preproduction XFT Stereo Assoc Modules	29-Nov-04	29-Nov-04	
1.3.6.5	SVT ready for installation	13-Dec-04	13-Dec-04	
1.1.2.3.1.4.9	Production hybrid available	16-Dec-04	16-Dec-04	
1.3.1.12	Beginning of TDC Production	10-Jan-05	10-Jan-05	
1.3.4.5.4.4	Arrival of Event Builder hardware	3-Feb-05	3-Feb-05	
1.1.5.3.4.8	Production module available	10-Feb-05	10-Feb-05	
1.2.1.10.10	Final Calorimeter CCR Detector Tested	24-Mar-05	19-May05	
1.2.1.10.9	Final Calorimeter CPR Detector Tested	24-Mar-05	19-May05	
1.3.5.5.5	Arrival of 70 L3 & 15 DAQ PCs from the vendor	24-Mar-05	24-Mar-05	
1.3.5.6.5	Arrival of 140/20 PCs from the vendor	24-Mar-05	24-Mar-05	
1.3.3.8.3.3	Begin Production of XFT Linker Modules	24-Mar-05	24-Mar-05	
1.3.3.2.6.9	Begin Production Finder SL7 boards	28-Mar-05	28-Mar-05	
1.3.5.8	Finish Purchase of Computers for L3/DAQ	14-Apr-05	14-Apr-05	
1.1.6.1.11.3.5	Layer Zero Silicon Supports Complete	5-May-05	2-May-05	
1.3.4.8	Finish Event-Builder Upgrade	5-May-05	5-May-05	
1.2.1.10.11	Final set of Calorimeter phototubes tested	6-May-05	29-Apr-05	
1.2.1.10.12	End of Central Preshower Project	6-May-05	19-May05	
1.2.3.5	End of Calorimetry Project: Level 2	6-May-05	19-May05	
1.3.2.9	Pulsar Level 2 subproject ready for installa	9-Jun-05	9-Jun-05	
1.1.5.4.4.11	100 Production staves complete	1-Jul-05	1-Jul-05	
1.3.1.14.16	Data Concentrator Production Completed	29-Jul-05	29-Jul-05	
1.1.6.3.1.3.3	Stave Installation Begins	1-Aug-05	1-Aug-05	
1.3.3.10.4.6	XFT Production Stereo Association Modules complete	18-Aug-05	18-Aug-05	
1.3.3.23	XFT Ready for Installation at CDF	29-Sep-05	29-Sep-05	
1.3.1.13.10	TDC Production Board testing complete	30-Sep-05	23-Sep-05	
1.3.1.16	Run 2b TDC Ready for Installation	30-Sep-05	23-Sep-05	
1.3.8	Finish Run 2b Trigger DAQ project	30-Sep-05	30-Sep-05	
1.1.5.4.4.14	Production staves complete	22-Nov-05	22-Nov-05	
1.1.6.3.2.3.6	Inner detector complete	4-Jan-06	11-Jan-06	
1.1.6.3.1.3.8	Stave Installation Complete	11-Jan-06	11-Jan-06	
1.1.6.3.1.3.16	Outer detector complete	9-Mar-06	9-Mar-06	
1.1.6.4.8	SVX2b Ready for Installation into ISL	31-May-06	31-May-06	

CDF Run2b Silicon Detector Schedule Level 2 Milestones

ID	WBS	Task Name	Date (2002–2006)	%
116	1.1.5.4.1.13	Silicon Project Outer Layer Prototype Stave #1 complete	11/5	100%
294	1.1.2.10.2.4	Silicon Project DAQ 1st round testing complete	4/3	100%
220	1.1.2.1.2.4	2nd SVX4 Chip submission	4/4	100%
39	1.1.3.1.2.4	Silicon Project Outer Layer Production Sensor submission	4/25	100%
232	1.1.2.1.3.5	SVX4 Production chip submission	9/18	0%
299	1.1.2.10.3.4	Go ahead for Silicon Project DAQ Preproduction	12/4	0%
708	1.1.6.3.1.1.5	Silicon Project - All stave installation & screen mounting tests complete	12/5	0%
381	l.1.2.3.1.3.12	Silicon Project preproduction hybrid available	4/29	0%
67	1.1.5.2.2.8	Silicon Project Layer Zero prototype modules complete	5/14	0%
306	1.1.2.10.4.6	Go ahead for Silicon Project DAQ Production	8/23	0%
391	1.1.2.3.1.4.9	Silicon Project production hybrid available	12/16	0%
103	1.1.5.3.4.8	Silicon Project Outer Layer Production module available	2/10	0%
630	l.1.6.1.11.3.5	Silicon Project Layer Zero Silicon Supports Complete	5/2	0%
151	1.1.5.4.4.11	Silicon Project - 100 Production Staves complete	7/1	0%
718	1.1.6.3.1.3.3	Silicon Project Stave Installation Begins	8/1	0%
156	1.1.5.4.4.14	Silicon Project - All Production Staves complete	11/22	0%
701	1.1.6.3.2.3.6	Silicon Project Inner Detector complete	1/11	0%
723	1.1.6.3.1.3.8	Silicon Project Stave Installation Complete	1/11	0%
731	l.1.6.3.1.3.16	Silicon Project Outer Detector complete	3/9	0%
740	1.1.6.4.8	SVX2b Ready for Installation into ISL	5/31	0

Project: CDF Run2b Silicon
Date: Aug 15 '03

Legend: Task; Progress; Baseline; Milestone; Baseline Milestone; Summary; Rolled Up Task; Rolled Up Milestone; Baseline Summary; Rolled Up Baseline; Rolled Up Baseline Milestone; Rolled Up Progress; Split; External Tasks; Project Summary

CDF Run2b Calorimeter Schedule Level 2 Milestones

WBS	Name	Date	% Complete
1.2.2.2.7.1	EMTiming Prototype Testing Complete	3/28	100%
1.2.1.10.1	1st Calorimeter phototube order placed	4/1	100%
1.2.2.2.7.3	EMTiming PEM Harnesses ready to install	4/28	100%
1.2.2.2.7.8	EMTiming VME Crate ready to installn	4/30	100%
1.2.2.2.7.2	EMTiming CEM Splitters ready to install	7/28	100%
1.2.2.2.7.4	EMTiming ASD->TDC Cables ready to install	8/26	0%
1.2.2.2.7.5	All EMTiming cables done and ready to install	8/26	0%
1.2.1.10.3	1st set of Calorimeter phototubes tested	10/20	0%
1.2.1.10.2	1st Calorimeter WLS fiber holder finished	12/4	0%
1.2.2.2.7.10	EMTiming Upstairs components ready to install	1/7	0%
1.2.2.2.7.6	EMTiming ASD/TB ready to install	1/8	0%
1.2.2.2.7.7	Downstairs EMTiming components ready to install	1/8	0%
1.2.2.2.7.11	All EMTiming components ready to install	1/8	0%
1.2.1.10.4	1st Calorimeter CPR module finished and tested	2/12	0%
1.2.1.10.5	2nd set of Calorimeter phototubes tested	2/18	0%
1.2.1.10.6	1st Calorimeter CCR module finished and tested	4/8	0%
1.2.2.2.7.9	EMTiming TDC boards ready to install	6/11	0%
1.2.1.10.7	50% Calorimeter CPR Detectors Tested	8/2	0%
1.2.1.10.8	50% Calorimeter CCR Detectors Tested	10/26	0%
1.2.1.10.11	Final set of Calorimeter phototubes tested	4/29	0%
1.2.1.10.9	Final Calorimeter CPR Detector Tested	5/19	0%
1.2.1.10.10	Final Calorimeter CCR Detector Tested	5/19	0%
1.2.1.10.12	End of Central Preshower Project	5/19	0%
1.2.3.5	End of Calorimetry Project: Level 2	5/19	0%

Timeline: 2003, 2004, 2005, 2006 — Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2

Project: CDF RunIIb Calorim
Date: Aug 15 '03

Legend: Task, Progress, Baseline, Milestone, Baseline Milestone, Summary, Rolled Up Task, Rolled Up Milestone, Baseline Summary, Rolled Up Baseline, Rolled Up Baseline Milestone, Rolled Up Progress, Split, External Tasks, Project Summary

CDF Run2b Trigger/DAQ Schedule Level 2 Milestones

ID	WBS	Name		
19	1.3.5.2.5	**Arrival of 0/10 PCs from the vendor**	9/10	0%
179	1.3.1.6.6	**First Prototype TDC available for testing**	11/20	0%
422	1.3.3.2.3.4	**Fabrication of Prototype XFT Finder 1/3 board**	1/8	0%
387	1.3.3.8.1.9	**Prototype XFT Linker Module available for testing**	3/26	0%
61	1.3.4.4.1.4	**Arrival of the prototype Event Builder hardware**	6/3	0%
72	1.3.4.5.3	**Event Builder Production Readiness Review**	6/24	0%
105	1.3.2.6.3	**Begin production of Level2 Pulsar system**	9/17	0%
361	1.3.3.10.3.3	**Begin Preproduction XFT Stereo Association Modules**	11/29	0%
11	1.3.6.5	**SVT ready for installation**	12/13	0%
215	1.3.1.12	**Beginning of TDC Production**	1/11	0%
78	1.3.4.5.4.4	**Arrival of the Event Builder hardware**	2/3	0%
397	1.3.3.8.3.3	**Begin Production XFT Linker Modules**	3/24	0%
36	1.3.5.5.5	**Arrival of 70 Level3 and 15 DAQ PCs from the vendor**	3/24	0%
49	1.3.5.6.5	**Arrival of 140/20 PCs from the vendor**	3/24	0%
461	1.3.3.2.6.9	**Begin Production XFT Finder SL7 boards**	3/28	0%
52	1.3.5.8	**Finish Purchase of Computers for Level3/DAQ system**	4/14	0%
83	1.3.4.8	**Finish Event-Builder Upgrade**	5/5	0%
115	1.3.2.9	**Pulsar Level 2 subproject ready for installation**	6/9	0%
234	1.3.1.14.16	**TDC Data Concentrator Production complete**	7/29	0%
372	1.3.3.10.4.6	**XFT Production Stereo Association Modules complete**	8/18	0%
256	1.3.1.13.10	**TDC Production Board testing complete**	9/23	0%
257	1.3.1.16	**Run 2b TDC Ready for Installation**	9/23	0%
468	1.3.3.23	**XFT Ready for Installation at CDF**	9/29	0%
469	1.3.8	**Finish Run 2b Trigger DAQ project**	9/30	0%

Timeline: 2 (Q2 Q3 Q4), 2003 (Q1 Q2 Q3 Q4), 2004 (Q1 Q2 Q3 Q4), 2005 (Q1 Q2 Q3 Q4), 2006 (Q1 Q2)

Project: CDF Run 2B Data A
Date: Aug 15 '03

Task
Progress
Baseline
Milestone
Baseline Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Baseline Summary
Rolled Up Baseline
Rolled Up Baseline Milestone
Rolled Up Progress
Split
External Tasks
Project Summary

IV. PROCUREMENT – P. Lukens

The requisition for preproduction TDC work at U. of Chicago was approved.

V. PROJECT HIGHLIGHTS

1.1 – Silicon Detector

1.1.1 Administration – Brenna Flaugher, Nicola Bacchetta

Work continued this month on the databases that will be used for the silicon sensors and for the hybrid assembly and testing. A student from Finland is working on adapting the Atlas database for our purposes.

1.1.2 DAQ (Data AcQuisition) – Brenna Flaugher, Nicola Bacchetta

We had a very successful workshop at LBL July 28 - 30. We had about 25 participants, with graduate students and new Postdocs joining the project. The focus was preparation for the preproduction efforts. We spent Monday at UC Davis getting updated on the status of the preproduction burn-in system and on the database development for tracking the assembly and testing of the hybrids. The first version of the database is already operational and will be ready for the 1st hybrids (WBS 1.1.1.4).

Testing continued on the 2nd prototype chip. All the results are good and there is high confidence that no changes would be needed for a production chip. Plans for irradiation of the chips were discussed at the workshop and subsequently scheduled for September 8th. Setup for production chip testing is almost complete. Some of the preproduction wafers have been fully tested using this system. It can test 2 wafers/day (as scheduled), but with some modifications it should be possible to speed it up.

The schedule for the transceiver chips was updated. The prototype transceivers actually function well enough to be used for production and the schedule was changed to reflect the fact that we will not need a 2nd prototype. One test remains and that is the assembly of the transceivers onto the preproduction Mini Port Cards. This should happen in August.

The preproduction order of hybrids was delivered in July. The first inspection results were encouraging and full testing will proceed in August. As part of the workshop in LBL, we visited the LBL shop which may possibly be used to assemble the production hybrids. We also visited a "stuffing house" in Silicon Valley that will also be used to assemble the production parts in parallel with the LBL shop. The plan for preproduction is to have each site (LBL and the stuffing house) assemble 40 hybrids at a fast pace. This should determine the rates possible for production. The lab space at LBL has been set up for hybrid testing with a mind toward streamlining the movement of parts. The wirebonder has been re-commissioned and is ready to be used to bond the stuffed hybrids.

A second L0 module was assembled using the cables from Dyconnex. Tests of the modules are underway with the different cable designs. At the workshop, the decision was taken to go with the overlapping cable design (used by Dyconex) since those cables were the best quality and also had the lowest capacitance.

The 2nd prototype bus cables were delivered and found to have some problems. The Kapton cover layer is not precisely aligned with the shield layer. Also, some of the cables are too short by 0.5mm. An effort was underway to figure out how many are useable. At first look, more than half of them should work and this will not delay the fabrication of the preproduction stave cores.

The vendors of the polymide and BeO MPC's made good progress and are on schedule for delivery in August. The Junction portcard design is nearly finished. Cables from the MPC to the JPC and from the JPC to the crates have been specified and ordered. Some have been delivered and subsequently sent out for assembly (attach connectors). Progress was made on the SRC design and a document of the specifications is in preparation.

1.1.3 Sensors – Brenna Flaugher, Nicola Bacchetta

The first batch of production sensors was delivered and tested. The sensors we have seen so far are all good quality and meet the performance specifications. More tests will be conducted to verify proper operation but the results to date have been very encouraging.

1.1.4 Cooling and Monitoring – Brenna Flaugher, Nicola Bacchetta

Progress continues on the internal manifold design and on the prototyping of the RASNIK position monitors.

1.1.5 Construction of Modules, Staves, and Layer Zero (L0) – Brenna Flaugher, Nicola Bacchetta

The first steps in preproduction module assembly were successfully completed. Two sensor pairs were glued together and are ready for hybrids. A preproduction electrical stave core has been built and is ready for modules.

1.1.6 Support Mechanics – Brenna Flaugher, Nicola Bacchetta

The prototype barrel structure was used for stave installation tests and for tests of the bulkhead alignment. The stave installation fixtures are complete and only slight modifications will be needed for production.

1.2 – Calorimeter

1.2.1 Central Preshower and Crack Detector – Steve Kuhlmann

The Central Preshower/Crack Upgrade continued to make progress in July. The main focus, at this time, has shifted to the fibers needed for the 2nd full-scale Preshower prototype, and the fibers for the 1st full-scale Crack prototype. This is discussed in detail in the next section. In addition to this, tiles for the first Crack prototype were delivered from Fermilab's Village Lab 8. Optimization tests continue at INFN, Rockefeller, and Argonne. One example of these tests is the comparison between a Tyvek tile wrap and a wrap using a relatively new 3M product called Radiant Mirror. The new wrap gave 43% more light output than Tyvek, hence we will use this for production modules.

1.0 mm Kuraray fibers, both clear and wavelength-shifting (WLS), were cut to length at Michigan State University and then delivered to Lab 7 at Fermilab where the ends were polished. The WLS fibers were then mirrored and coated with the standard UV-cure epoxy (Red Spot). The Fermilab stock of the Red Spot epoxy had essentially run out, and the company was refusing to produce more. Enough of the epoxy was found at Michigan State, however, to cover any future R&D and production needs for the CPR and crack chambers. There is a shortage of thin-wall shrink tubing used for splicing the clear and WLS fibers because the manufacturer is unwilling to produce additional tubing if ordered in small quantities. Two options were determined for proceeding to obtain the needed quantities, with a decision to be made this coming month. In the short-term, thicker-wall tubing can be used, but at the price of a small decrease in light transmission.

The Kuraray WLS plus clear fibers will be used to instrument prototypes for both the Crack and CPR modules. In addition, a spool of a larger diameter (1.1 mm) clear fiber is being used to manufacture optical cables for CPR and Crack chamber readout.

1.2.2 Electromagnetic Timing – Dave Toback

July 2003 saw the continued success of the EM Timing project. The production quality prototypes are installed on the detector and are continuing to function better than expected. The rest of the components are in production, on or well ahead of schedule, or are already completed. The PEM harnesses are complete, tested, and ready to be installed. The CEM splitter harnesses are complete, tested, and ready to be installed. The production of the ASD->TDC cables is nearly complete with 42 of the 52 cables delivered; testing has begun. The TDC crate is fully functional, well ahead of schedule. We have 20% of the TDC's in hand and it is expected the others will be available before the scheduled arrival date. The ASD's and TB printed circuit boards (PCBs) have arrived in Italy and have been sent, along with the electronic components and connectors, to the company that will stuff the boards. These are also well ahead of schedule. Our test stand room is fully functional with production quality components for final testing when the boards arrive. It is believed that all components are on schedule to be ready by the end of the summer.

1.3 –Data Acquisition and Trigger

1.3.1 TDC (Time to Digital Converter) – Henry Frisch, Ting Miao

The delivery of the adapter card needed for replacing VME interface chips got delayed. We are talking to the vendor directly about this. Beside that, we are setting up a VME test stand in Wilson Hall at Fermilab to examine the timing diagram of the existing TDC's to understand the data output rate limit. New VME chip programming is expected to start at the beginning of August.

1.3.2 Level 2 – Ted Liu, Peter Wittich

The CDF Level 2 Trigger system continues to make progress on the following fronts:

- Pulsar hardware, firmware and VME software,
- PCI and CPU performance studies, and

- S-LINK data format definition for all data paths.

All Pulsar prototypes have been fully tested for robustness. No design problems have been identified therefore we are convinced there is no need for any design revisions. This includes the following components:

- Pulsar motherboard,
- Hotlink transmitter and receiver mezzanine cards,
- Taxi transmitter and receiver mezzanine cards, and
- Back of crate transition module.

Both Pulsar firmware and VME software have been greatly improved to allow fully automated testing. With the automated testing procedures and the complete success of all prototypes, we are getting ready for Pulsar hardware preproduction, roughly six months ahead of schedule. The mezzanine card production has been finished. Approximately 50% of the cards have been fully tested and testing of the rest is on-going. Preproduction of the Back of crate transition modules will begin in August 2003.

The work on testing the CPU performance on modern CPUs with Linux operating system for the Level 2 trigger decision algorithm latency has been completed. The results indicate that modern CPUs (~2 GHz desktop PCs) with Linux operating systems have much better performance than the old Alpha's (500MHz without operating system) being used in the current Level 2 trigger system. The work on testing the SLINK to PCI card (S32PCI64, designed at CERN for Atlas) performance has been done and it performed as expected.

More specific details about the project progress can be found at:
http://hep.uchicago.edu/~thliu/projects/Pulsar/L2_upgrade_meeting.html

1.3.3 XFT (eXtremely Fast Tracker) II – Richard Hughes, Brian Winer

The Linker upgrade work at OSU has been focused on implementing the improved tracking linking algorithm in the latest Altera Stratix devices. We have fit the design into the target device (an EP1S25), but we are struggling with trying to pass a set of test vectors through the Altera simulator. We have successfully tested smaller portions of the design with the simulator, but not yet the full design.

1.3.4 Event Builder – Bruce Knuteson

The group has decided to pursue gigabit Ethernet technology rather than ATM, the proprietary telecommunications technology used in the present system. Primary reasons for the change are the significant cost of upgrading the ATM switch as well as the increased popularity of and familiarity gained with Ethernet in the recent past, including the successful deployment of gigabit Ethernet in D0's DAQ.

The group is converging on a Cisco Catalyst 6500 series gigabit switch, and on a VMIC 7700 or 7800 series single board computer to read out CDF's VRB crates into the switch. Quotes for both the Cisco switch and the VMIC single board computer are being generated.

The Run IIb EVB group has expanded to include the valuable expertise of Ron Rechenmacher, who played a large role in the design of D0's gigabit Ethernet DAQ. Mark Bowdin has agreed to help with VRB questions that arise. David Tang and Phil Demar in the Computing Division have provided valuable assistance on switching options. We have profited greatly from discussions and tours of the D0 DAQ with Doug Chapin, Gordon Watts, and Gustaaf Broojmans. Steve Tether and Sham Sumorok have done much of the fleshing out of the system's design. Bruce Knuteson has replaced Christoph Paus as the Level 3 manager for this portion of the Project.

1.3.6 SVT (Silicon Vertex Tracker) – Bill Ashmanskas, Luciano Ristori

No work is scheduled to begin on the Silicon Vertex tracker trackfitter and merger boards until early in calendar year 2004.

VI. FINANCIAL STATUS

The accompanying tables and charts are the Cost Performance Reports generated from COBRA. These give a summary of the financial tracking of the project, as measured by the Earned Value. Input data for the earned value calculation originates with the status of project completion, as reported by the Level 2 managers, and actual costs extracted from the Fermilab accounting system.

The following charts and tables are attached:

CDF Project Variance Analysis Report - This report gives a high level summary of the cost and schedule variances of the project as a whole.

CDF Project Cost Performance Report - This report gives a complete earned value calculation of the project down to Level 3 of the Work Breakdown Structure. Earned value calculations are shown for this reporting period (columns 2-6) as well as the project to date (columns 7-11). Column 12 contains our current value of BAC, and will only be changed after the formal implementation of the Change Control process.

CDF Project Performance Indicator Plot - This graph provides a display of the Schedule and Cost Performance Indicators over time. SPI and CPI tracking bands are as follows:

Green	-	Between 0.9 and 1.15
Yellow	-	Between 0.85 and 0.95 or between 1.15 and 1.25
Red	-	Less than 0.85 or Greater than 1.25

CDF Project Financial Plot - This plot provides a monthly indication of the work scheduled, work performed, and the actual costs.

CDF RunIIb Obligations Report - This report provides a summary, at Level 2, of the outstanding requisitions and purchase orders where money has been committed but for which the Project has not been invoiced. This does not include requisitions in the system that have not had a Fermilab Purchase Order number assigned as of the date of the report.

CDF RunIIb Baseline BCWS - This plot provides an integrated view of the work scheduled, work performed, and the actual costs of the Project to date.

A number of specialized terms and abbreviations are used in the reports. They are defined here for convenience:

ACWP – Actual Cost of Work Performed. This is the actual cost of tasks that have been completed.

BAC – Budget at Completion. The BAC is the estimated total cost of the project when completed. It is equivalent to the BCWS at completion. The baseline value of the BCWS is contained in column 12 of the **Cost Performance Report**.

BCWP – Budgeted Cost of Work Performed. This is the scheduled cost profile of tasks that have been completed.

BCWS – Budgeted Cost of Work Scheduled. This is the sum of the budgets for all planned work to be accomplished within a given time period.

CPI – Cost Performance Index. $CPI = \frac{BCWP}{ACWP}$

CV – Cost Variance. $CV = BCWP - ACWP$

EAC – Estimate At Completion. This is the ACWP to date, plus the BCWS (current scheduled estimate) of remaining tasks. $EAC = (BAC\ (current) - BCWP) + ACWP$

EV – Earned Value. $EV = BCWP$

ETC – Estimate to Completion. $ETC = EAC - ACWP + Contingency$

Percent Complete - $\%Com = \frac{BCWP}{BAC}$

SPI – Schedule Performance Index. $SPI = \frac{BCWP}{BCWS}$

SV – Schedule Variance. $SV = BCWP - BCWS$

CDF Project Variance Analysis Report

Reporting Period: 6/30/2003 to 7/31/2003

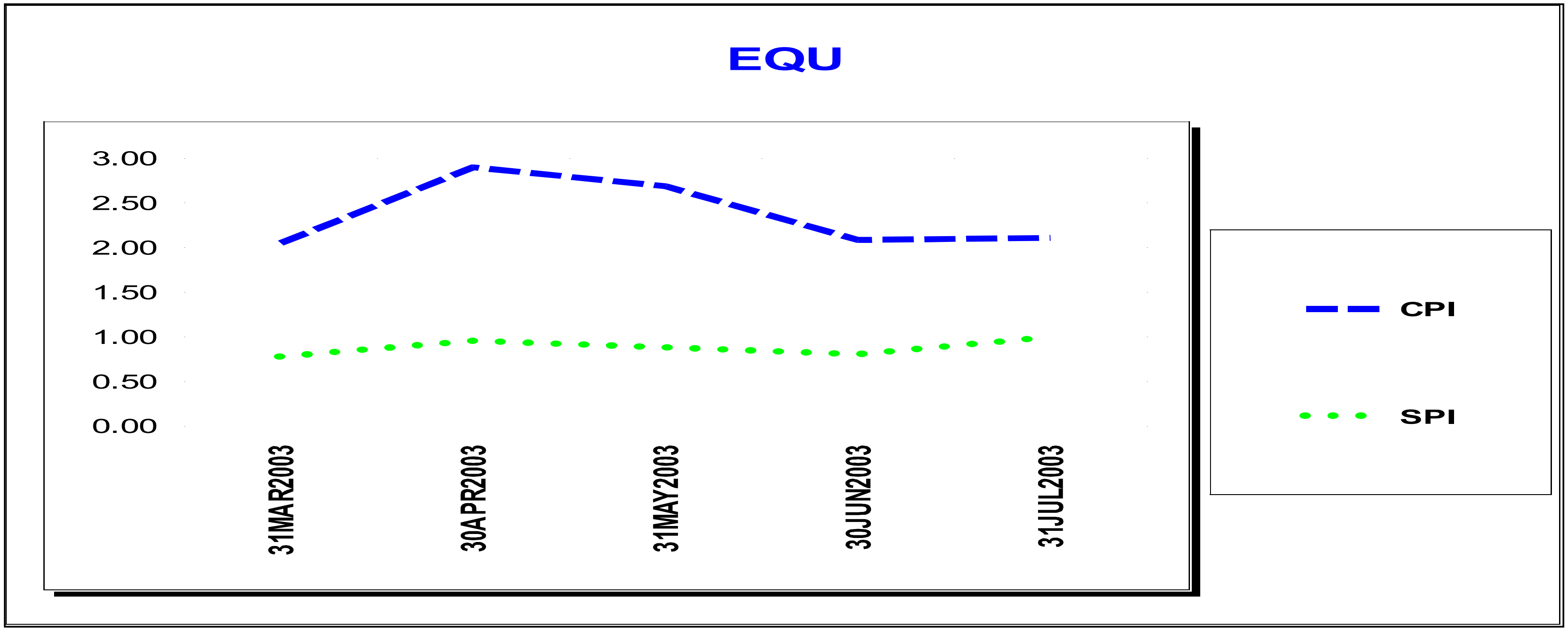
	BCWS	BCWP	ACWP	SV in $	SV in %	CV in $	CV %	SPI	CPI
Current:	286,696	459,965	214,586	173,269	60%	245,379	53%	1.60	2.14
Cumulative:	1,206,238	1,188,979	564,879	-17,260	-1%	624,099	52%	0.99	2.10
	BAC	**EAC**	**VAC in $**	**VAC in %**	**CPI to BAC**	**CPI to EAC**			
At Complete:	17,422,423	16,812,340	610,083	4%	0.96	1.00			

CDF Project EQU Cost Performance Report at WBS Level 3

Cost Performance Report - Work Breakdown Structure								
Contractor: Location:			Contract Type/No:		Project Name/No: CDF RIIb Master EQU		Report Period: 6/30/2003	7/31/2003
Quantity	Negotiated Cost	Est. Cost Authorized Unpriced Work	Tgt. Profit/ Fee %	Tgt. Price	Est Price	Share Ratio	Contract Ceiling	Estimated Contract Ceiling
1	24,987,050	0	0 0	24,987,050	0		0	0

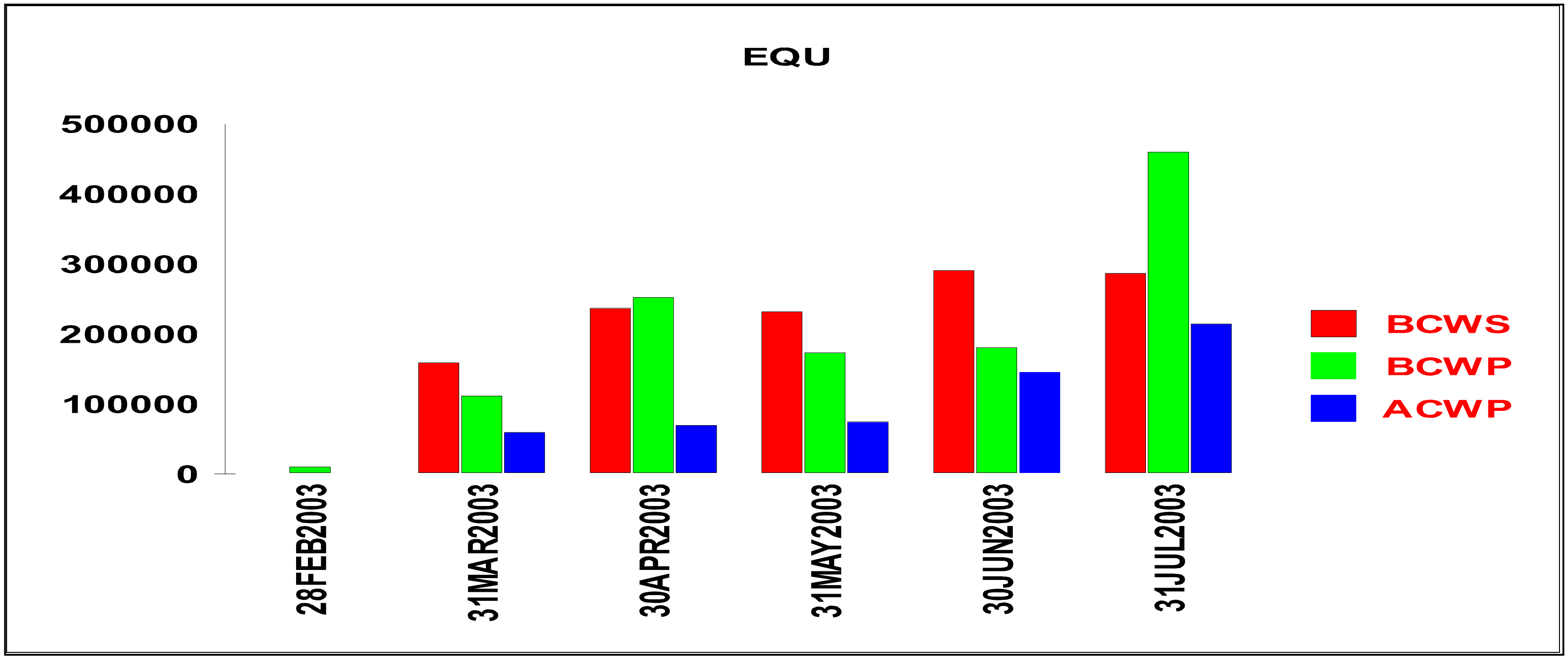
Funding Type-CA WBS[2] WBS[3] Item	Current Period Budgeted Cost Work Scheduled	 Budgeted Cost Work Performed	 Actual Cost Work Performed	 Variance Schedule	 Variance Cost	Cumulative to Date Budgeted Cost Work Scheduled	 Budgeted Cost Work Performed	 Actual Cost Work Performed	 Variance Schedule	 Variance Cost	At Completion Budgeted
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
EQU											
1.1 Run 2b Silicon Project											
1.1.1 Administration	11,886	12,084	0	198	12,084	56,330	56,572	0	243	56,572	461,456
1.1.2 DAQ	91,585	113,122	111,151	21,537	1,971	310,691	317,064	157,080	6,372	159,983	5,114,383
1.1.3 Sensors	906	181,725	0	180,819	181,725	21,461	200,042	0	178,581	200,042	945,613
1.1.4 Cooling and Monitoring	17,737	1,573	0	-16,164	1,573	96,344	15,732	0	-80,611	15,732	486,199
1.1.5 Construction of Modules, Staves and L0	2,151	22,989	30,424	20,838	-7,434	2,151	23,864	66,550	21,713	-42,686	2,141,524
1.1.6 Support Mechanics	67,299	56,331	35,494	-10,968	20,837	297,666	291,377	187,142	-6,289	104,235	2,858,484
WBS[2]Totals:	191,565	387,824	177,069	196,259	210,756	784,643	904,652	410,773	120,009	493,879	12,007,658
1.2 Calorimeter Upgrades											
1.2.1 Central Preshower and Crack Detectors	17,087	5,224	2,060	-11,863	3,164	28,364	17,971	3,074	-10,392	14,897	306,093
1.2.2 Electromagnetic timing	5,718	6,416	6,051	698	366	28,152	35,630	23,385	7,478	12,245	35,630
WBS[2]Totals:	22,806	11,640	8,111	-11,166	3,529	56,516	53,602	26,460	-2,914	27,142	341,723
1.3 Run 2b DAQ and Trigger Project											
1.3.1 Run 2b TDC Project	10,905	14,716	0	3,811	14,716	83,261	39,719	0	-43,541	39,719	1,105,744
1.3.2 Run 2b Level 2 Project	0	7,843	174	7,843	7,670	0	7,843	174	7,843	7,670	366,655
1.3.3 Run 2b XFTII Project	15,884	138	0	-15,746	138	85,284	138	0	-85,146	138	1,146,971
1.3.4 Event-Builder Upgrade	0	0	0	0	0	0	0	0	0	0	515,472
1.3.5 Computer for Level3 PC Farm / DAQ	6,714	0	0	-6,714	0	12,553	0	0	-12,553	0	478,410
1.3.6 SVT upgrade	0	0	0	0	0	0	0	0	0	0	174,441
WBS[2]Totals:	33,504	22,698	174	-10,806	22,524	181,098	47,701	174	-133,397	47,527	3,787,693
1.4 Administration											
1.4.3 Construction Phase	38,822	37,803	29,232	-1,019	8,571	183,982	183,025	127,473	-957	55,552	1,285,349
WBS[2]Totals:	38,822	37,803	29,232	-1,019	8,571	183,982	183,025	127,473	-957	55,552	1,285,349
Funding Type - CA Totals:	286,696	459,965	214,586	173,269	245,379	1,206,238	1,188,979	564,879	-17,260	624,099	17,422,423
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0
Sub Total	286,696	459,965	214,586	173,269	245,379	1,206,238	1,188,979	564,879	-17,260	624,099	17,422,423
Management Resrv.											7,564,627
Total	286,696	459,965	214,586	173,269	245,379	1,206,238	1,188,979	564,879	-17,260	624,099	24,987,050

CDF Project Performance Indicator Plot - 1 August 2003



	31MAR2003	30APR2003	31MAY2003	30JUN2003	31JUL2003
CPI	204.59%	289.49%	268.27%	208.12%	210.48%
SPI	76.67%	94.4%	87.15%	79.28%	98.57%

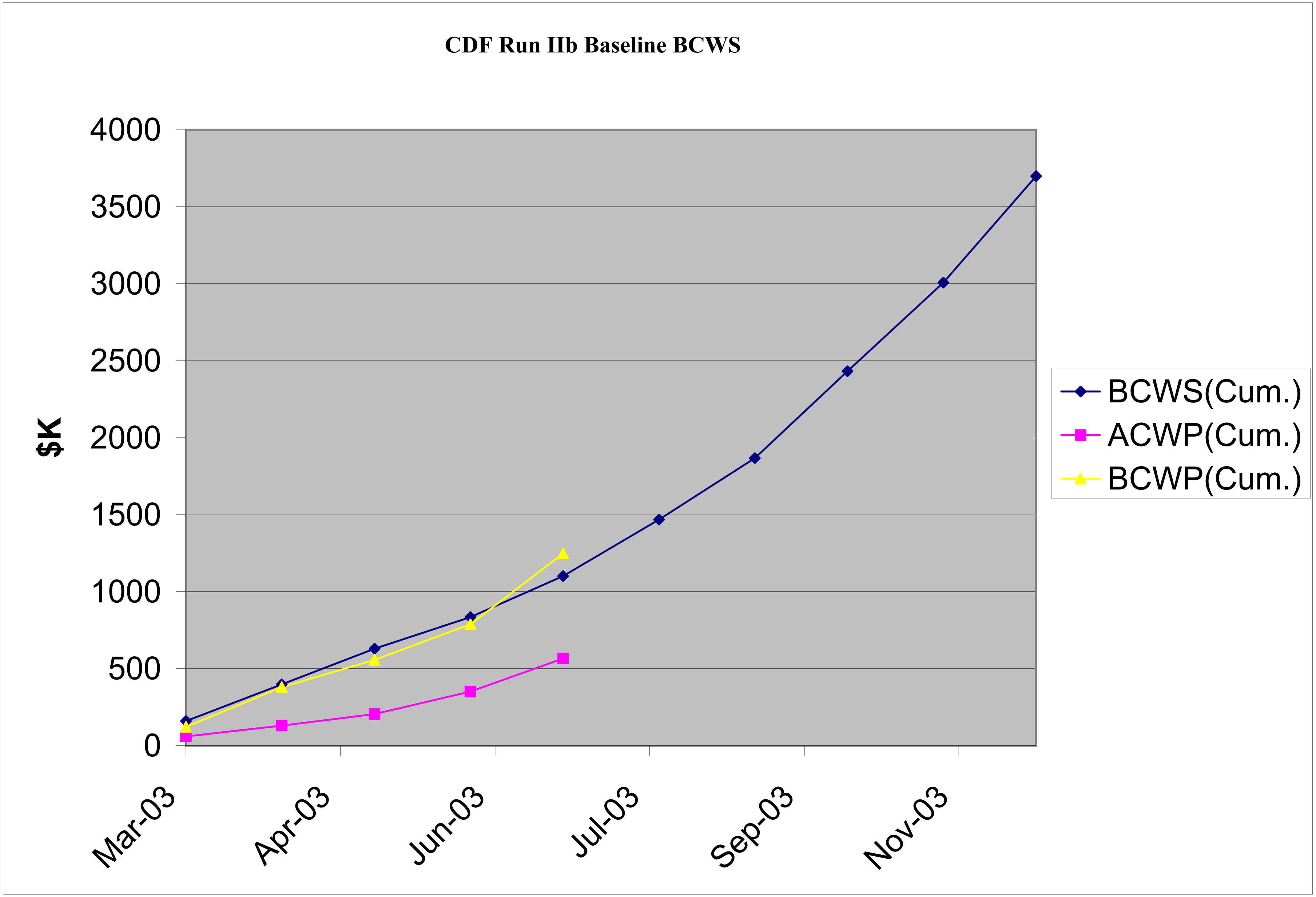
CDF Project Financial Plot - 1 August 2003



	28FEB2003	31MAR2003	30APR2003	31MAY2003	30JUN2003	31JUL2003
BCWS	0	159,317	237,301	232,032	290,891	286,696
BCWP	10,272	111,870	252,273	173,438	181,160	459,965
ACWP	0	59,700	69,635	74,882	146,077	214,586

CDF Run2b Project Obligations Report

CDF RIIb EQU - JUL FYO3 IN $K									
Task Number	Expenditure Category	YTD Obligations Budget	Current Obligations Budget Balance	Current Mth Total Cost	Current Mth Obligation	YTD Total Cost	YTD OBLIGATIONS W/INDIRECT	Current PO Open Comm
	M&S	576.3	211.2	91.9	58.6	110.7	787.5	676.7
	SWF	523.3	308.8	53.8	53.8	214.5	214.5	0.0
	OH	221.0	0.0	31.5	0.0	85.4	85.4	0.0
TOTAL SILICON: 1.1		1320.6	97.6	177.2	112.4	410.6	1087.4	676.7
	M&S	66.9	66.9	0.0	0.0	0.0	0.0	0.0
	SWF	64.0	43.8	6.2	6.2	20.3	20.3	0.0
	OH	20.3	0.0	1.9	0.0	6.1	6.1	0.0
TOTAL CALORIMETER: 1.2		151.2	110.7	8.1	6.2	26.4	26.4	0.0
	M&S	134.4	131.6	0.1	2.7	0.1	2.7	2.6
	SWF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	OH	4.3	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL DAQ: 1.3		138.7	131.6	0.1	2.7	0.1	2.7	2.6
	M&S	4169.5	4163.3	5.6	5.6	6.2	6.2	0.0
	SWF	118.4	25.8	17.7	17.7	92.6	92.6	0.0
	OH	1070.3	0.0	6.0	0.0	28.8	28.8	0.0
TOTAL ADMINISTRATIVE: 1.4		5358.2	4189.1	29.3	23.3	127.6	127.6	0.0
TOTAL PROJECT:	M&S	4947.1	4150.6	97.6	66.9	117.0	796.4	679.3
	SWF	705.7	378.4	77.7	77.7	327.4	327.4	0.0
	OH	1315.9	0.0	39.4	0.0	120.3	120.3	0.0
Grand Total		6969.0	4529.1	214.6	144.5	564.9	1244.1	679.2



CDF Run IIb Baseline BCWS
$K
4000
3500
3000
2500
2000
1500
1000
500
0
Mar-03
Apr-03
Jun-03
Jul-03
Sep-03
Nov-03
BCWS(Cum.)
ACWP(Cum.)
BCWP(Cum.)

VII. VARIANCE ANALYSIS – P. Lukens

The Cost Performance Index (CPI) has a value of almost 2.1 this month. The small quantity of work performed to date makes the CPI susceptible to "start-up" effects, as described in May 2003. We expect this to reduce towards 1.0 as the project matures. We plan to implement cost accruals next month to more accurately describe work that has been performed, but has not yet been costed.

The Schedule Performance Index (CPI) jumps slightly this month to 1.13, due to the reported progress on the manufacture of the silicon sensors.

VIII. BASELINE CHANGES

No baseline changes were made in July.

IX. FUNDING PROFILES

The table, below, contains the funding plan for the Project. Specific information relating to spending profiles for the current fiscal year is available above in Section VI, Financial Status. This is the funding profile submitted to the DOE Office of Science in the Project Execution Plan (PEP).

	2002	2003	2004	2005	2006	Totals
US - M&S	$ 2,750,000	$ 1,580,000	$ 5,292,456	$ 7,073,262	$ 242,418	$ 16,938,135
US - Labor	$ 250,000	$ 1,250,000	$ 1,989,300	$ 2,607,789	$ 651,352	$ 6,748,441
US - G&A	$ 500,000	$ 639,000	$ 1,114,182	$ 1,616,354	$ 219,344	$ 4,088,880
US - Equip. Total	$ 3,500,000	$ 3,469,000	$ 8,395,938	$ 8,508,623	$ 1,113,114	$ 24,986,676
US - R&D	$ 1,670,000	$ 480,000				$ 2,150,000
Japan	$ 235,465	$ 867,229	$ 1,080,700	$ 9,600	$ -	$ 2,192,994
Italy	$ 64,506	$ 350,838	$ 260,946	$ -	$ -	$ 676,290
University	$ 23,557	$ 224,780	$ 103,030	$ 26,040	$ -	$ 377,407
Total Funding	$ 5,493,528	$ 5,391,847	$ 9,840,614	$ 8,544,263	$ 1,113,114	$ 30,383,366

The following table contains current values for selected financial tracking quantities that do not appear in the Cost Performance Report.

	30 June 2003	31 July 2003
Estimate to Completion	$24,608 K	$24,421 K
Percent Complete	4.2 %	6.8 %